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WARP KNITTING MACHINE

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FIG.1

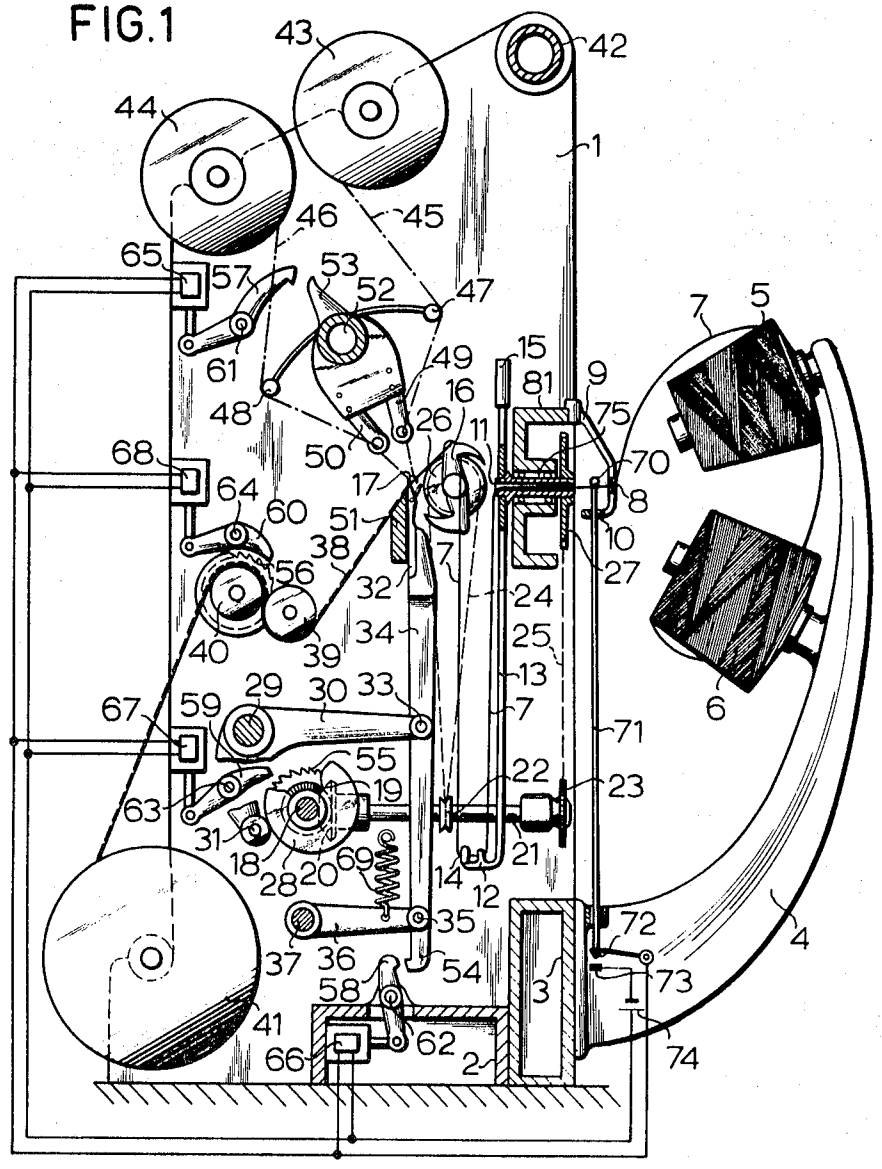
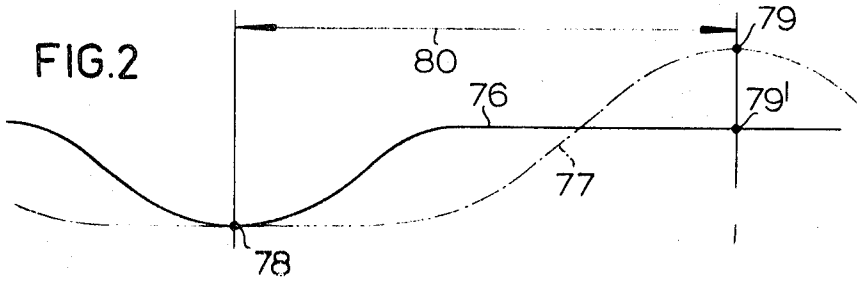


FIG.2



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WARP KNITTING MACHINE

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ABSTRACT OF THE DISCLOSURE

Warp knitting machine, such as a Raschel knitting machine particularly, having a device for filling a weft includes thread monitoring means disposed in the path of the weft and responsive to a break in the weft for controlling the stitch-forming members and the knitted fabric winding means of the machine.

My invention relates to a warp knitting machine, such as a Raschel knitting machine particularly, having a device for filling a weft.

In warp knitting machines with weft filling over the entire width of a warp knitted fabric or over large portions thereof, rapidly rotating and high inertia devices for moving a separately fed weft are required to achieve high operation speeds. If there is then an interruption in the feed of the weft to such machines, for example due to a break in the thread, there must be assurance that this interruption, notwithstanding the stopping of the weft filling device, leaves no defect behind in the fabric being produced.

It is accordingly an object of my invention to provide warp knitting machine which, upon the stopping of the weft-filling operation, for example due to the breaking of the thread, prevents the formation of a defect in the fabric being knitted.

With the foregoing and other objects in view, I provide in accordance with my invention, warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along the feed path, stitch-forming members in the weft feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, and thread monitoring means located in the path and responsive to a break in the weft for controlling the stitch-forming members and the fabric winding means.

In accordance with further features of my invention, the thread monitoring means located in the weft feed path is disposed directly behind or downstream of a first inlet or guiding eye, a thread tensioner or the like so that the absence of a weft due to a break therein for example is immediately detected, controlling mechanism for the stitch-forming members can be actuated and the motion producing means for effecting the stitch formation and for driving the fabric winding means in response to the thread monitoring means are able to be blocked.

A comprehensive locking of the movements producing the stitch formation is effected in accordance with my invention by blocking the rotary control shaft which drives the stitch-forming members.

In accordance with additional features of my invention, each of the stitch-forming members can be blocked respectively. Thus, for example, means can be provided for blocking the needle bar of the knitting machine, the means for effecting the oscillating motion of the filling bars and the means for effecting controlling motion of filling bars. It is furthermore an advantageous and added feature of my invention to provide means for

blocking the drive mechanism for the fabric winding means. In order to keep the force produced by blocking rapidly reciprocating members as small as possible, in accordance with a further feature of my invention, the means for blocking the drive mechanism for producing the stitch formation are effective at the motion reversal points of the drive mechanisms i.e. at the top and bottom dead centers thereof, the stitch-forming members having transmission elements loosely connected to a control cam by force-storing means.

To achieve most rapid blocking, in accordance with my invention, the blocking means comprise lock pawls or latches and actuation thereof by thread monitoring means is effected through electromagnets energized by a thread feeler or sensing member.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in warp knitting machine, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view partly in section of a warp knitting machine i.e. a Raschel knitting machine, constructed in accordance with my invention; and

FIG. 2 is a space-time curve for the needle bar and the eye needles of the machine.

Referring now to the drawings and first particularly to FIG. 1 there is shown a Raschel knitting machine having a projecting arm **4** secured by connecting members or cross pieces **2** and **3** to a frame side wall **1**. A pair of cross wound bobbins or cheeses **5** and **6** are carried by the arm **4** and the threads wound thereon are connected in a conventional manner for the purpose of affording continuous unwinding of a weft **7** therefrom. The weft **7** is guided from the cheese **5** through an eye **8** formed on a holder **9** mounted on another connecting member or cross piece **81** which extends from the frame side wall **1**. The weft **7** then passes through a tubular shaft **11** extending transversely from a rod **13** bent in the form of a crank, and further passes through a thread guide **14** located at an outer or free end **12** of the rod **13**. The rod **13** is provided with a counterweight **15** at the end thereof opposite the free end **12**. From the thread guide **14**, the weft **7** passes to a holder member **16** located in the vicinity of the weft reversal points and, from there is further conducted to the latch needles **17** of the knitting machine. The members **11** through **16** represent the essential elements of a device for filling a weft which fills or inserts the weft along a circular travel path in order to achieve the greatest possible thread-filling speed. For greater details regarding the structure and operation of such a filling device, reference may be had to my copending application Ser. No. 840,161, filed July 9, 1969.

The filling device **11** through **16** of my invention is driven by a control shaft **18**, meshing bevel gears **19** and **20**, a shaft **21** with drive or sprocket wheels **22** and **23** mounted thereon, and which are connected by chain drive means **24** and **25** with further drive or sprocket wheeels **26** and **27** respectively. The control shaft **18** carries an eccentric or cam **28** by means of which a lever **30** carrying a follower roller **31** in engagement with the surface of the cam **28**, is pivotable about a pivot bearing **29**. The lever **30** is connected by an articulating joint **33** with a carrier rod **34** which supports a needle bar **32**,

and raises and lowers the latter in accordance with the motion imparted thereto by the rotating cam 28. The carrier rod 34 is connected at a lower end portion thereof, as viewed in FIG. 1, through an articulating joint 35 to a pull lever 36, which is rotatably mounted on a pin 37 extending from the side wall 1. A connection with the control cam 28 is produced by a force-accumulating device such as a tension spring 69 through the articulating joints 35 and 33, on the one hand, and 29 and 37, on the other hand.

A cutting plate 51 is fixed to the side wall 1 and extends transversely thereto. The knitted fabric 38 is withdrawn from the needles 17 by rotatably mounted feed rollers 39 and 40 suitably, for example, through non-illustrated transmission mechanism, from the main drive shaft of the machine, and is wound on a fabric winding beam 41. At the upper part of the side wall 1 as viewed in FIG. 1, a traverse 42 is mounted transverely to the side wall 1. In addition, partial warp beams 43 and 44 are rotatably mounted on the upper part of the side wall 1, and warp threads 45 and 46 lead therefrom, respectively, through spring rocker arms 47 and 48 to the eye needles 49 and 50. Through an oscillating shaft 52, the eye needles 49 and 50 which are provided at an opposite end thereof with a locking nose 53, are subjected to a conventional oscillating and controlling motion. A locking nose 54 is also located at the lower end of the holder 34 by which the needle bar 32 is displaced. In addition, ratchet wheels 55 and 56 are mounted respectively on the control shaft 18 and the feed roller 40 for advancing knitted fabric to the beam 41. Pawl or stop latch levers 57, 58, 59 and 60 are coordinated respectively with the locking noses 53 and 54 as well as the ratchet wheels 55 and 56 and are respectively pivotally mounted on pins 61, 62, 63 and 64 and actuated by electromagnets 65, 66, 67 and 68 respectively.

If the supply of weft 7 is interrupted for any reason during the operation of the Raschel knitting machine, the thread sensing or monitoring member 70 which is in the form of an enlarged head member normally supported by the weft 7, then drops downwardly and, by means of an elongated connecting member 71, which is in engagement with a pivotable contact 72, causes the latter to pivot into engagement with a fixed contact 73. Accordingly, the electromagnets 65, 66, 67 and 68, which are energized by an electric current source 74 are actuated so that the pawls 57, 58, 59 and 60 are pivoted into locking or latching position so as to immediately block the control shaft 18, the eye needles 49 and 50, the needle bar 32 and the supply roller 40 through the respective locking noses 53 and 54 and the ratchet wheels 55 and 56. By the same means, the control motion of the eye needles 49 and 50 is carried out by the oscillating shaft 52 in a direction at right angles to the plane in which the side wall 1 is located. For reasons of clarity, the stop mechanisms for blocking the latter control movement is omitted from FIG. 1.

By blocking the control shaft 18, the shaft 21 and, accordingly, the members 11 throuhg 16 of the device for filling a weft are arrested. This blocking action is not applied abruptly to the device for filling a weft because the crank-like rod 13 rotates on the tubular shaft 11 thereof in a bearing 75 formed as a freewheeling or coast bearing, and consequently comes to a stop gardually and with a specific tapering-off movement. This gradual stopping motion has no disadvantageous effect on the fabric being produced because the stitch-forming members are promptly arrested. In order to keep the forces produced by the blocking of all the rapidly reciprocatingly pivoting stitch-forming members as small as possible, the instant at which the blocking is effected is selected by non-illustrated but conventional control means so that the blocking occurs at the reversal points of the stitch-forming members.

Obviously, blocking of the stitch-forming members can also be effected through other suitable means, for example brakes or the like. It is furthermore possible to provide a device for filling a weft with an additional release clutch for braking the decelerating or tapering-off pivoting motion of the rod 13.

After removing the disturbance in the feed of the weft 7, upon breaking engagement of the contacts 72 and 73, the pawls 57, 58, 59 and 60 are again released with the help, if necessary, of conventional means not illustrated in FIG. 1. Thereafter the operation of the knitting machine is resumed.

In FIG. 2 there is shown a space-time curve of two stitch-forming members, the solid line 76 representing the path of movement of the needle bar 32, and the dot dash line 77 representing the path of movement of the eye needles 49 and 50. According to this space-time curve of FIG. 2, the blocking occurs at the point 78 and the point 79 or 79′ respectively which are simultaneously the reversal points of the needle bar 32 and the eye needles 49 and 50 respectively. The path length 80 located between the revseral points 78 on the one hand and 79 and 79′ on the other hand, corresponds to an angular travel of 180°.

The invention of the instant application permits immediate interruption of the stitch formation and stopping only of the stitch-forming members with their relatively short paths of movement independently of the movement of a weft filling device in a warp knitting machine in the absence of a weft caused for example by breaking of the thread. The rapidly revolving, high inertia device for filling the weft, which has a relatively long path of movement, can in contrast be stopped with allowance for the required deceleration or tapering-off movement thereof. Blocking of the device for filling the weft alone would not prevent further stitch formation and would result in defective or waste fabric.

I claim:

1. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming means including a plurality of knitting needles and means for moving said needles in said feed path so as to form a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming means and said fabric winding means, and blocking means operatively connected to said thread monitoring means and actuable thereby for intercepting and blocking movement of said stitch-forming means and of said fabric winding means.

2. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, a rotatable control shaft operatively connected to all of said stitch-forming members for driving the same, and blocking means operatively connected to said thread monitoring means and actuable thereby for blocking the rotation of said control shaft.

3. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, sttich-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, said stitch-forming members including a needle bar, and blocking means operatively connected to

said thread monitoring means and actuable thereby for blocking movement of said needle bar.

4. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, said stitch-forming members including a plurality of oscillating eye needles, and blocking means operatively connected to said thread monitoring means and actuable thereby for blocking the oscillation of said eye needles.

5. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, said stitch-forming members including a plurality of eye needles and means for imparting a controlling movement to said eye needles, and blocking means operatively connected to said thread monitoring means and actuable thereby for blocking the controlling movement of said eye needles.

6. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming means including a plurality of knitting needles and means for moving said needles in said feed path so as to form a knitted fabric from the warp and weft, means for winding up the knitted fabric, and thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming means and said fabric winding means, said fabric winding means comprising a rotatable beam and drive means for rotating said beam, and including blocking means operatively connected to said thread monitoring means and actuable thereby for intercepting and blocking movement of said drive means.

7. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, means for moving said stitch-forming means in a reciprocating path having end reverse points, and blocking means operatively connected to said thread monitoring means and actuable thereby for blocking movement of said stitch-forming means at said reverse points.

8. Warp knitting machine according to claim 2 including a control cam carried by said rotatable control shaft, transmission means operatively connected on the one hand to said stitch-forming members, and force-storing means operatively connecting said transmission means, on the other hand, to said control cam.

9. Warp knitting machine comprising means defining a given weft feed path, a device for filling a warp with a weft traveling along said feed path, stitch-forming members in said feed path forming a knitted fabric from the warp and weft, means for winding up the knitted fabric, thread monitoring means located in said feed path and responsive to absence of the weft in said feed path for controlling said stitch-forming members and said fabric winding means, blocking means operatively connected to said thread monitoring means and actuable thereby for blocking movement of said stitch-forming members and of means for driving said fabric winding means, electromagnet means operatively connected to said blocking means, said thread monitoring means being actuable in response to absence of the weft in said feed path for connecting an energizing source to said electromagnet means so as to actuate said blocking means.

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